

COMMUNICATION

Chambers.

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FROM THE

CANAL COMMISSIONERS,

ACCOMPANIED WITH DOCUMENTS

RELATIVE TO THE CONNEXION OF THE IMPROVEMENTS

OF THE

STATE OF NEW YORK,

WITH THE

NORTH BRANCH CANAL.

READ IN THE HOUSE OF REPRESENTATIVES, FEBRUARY 27, 1839.

HARRISBURG:

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COMMUNICATION.

CANAL COMMISSIONERS' ROOM, }
Harrisburg, February 27, 1839. }

TO WILLIAM HOPKINS, ESQ.

Speaker of the House of Representatives.

SIR:—In answer to the resolution of the House of Representatives, requesting the board of canal commissioners “to report to the House the measures adopted by the State of New York, to connect the improvements of that state by rail-roads or canals, with the extension of the North Branch division of the Pennsylvania canal,” I have been directed to state that this board has had no official communication from the authorities of New York upon the subject referred to in the resolution. From information received, however, through private channels, as well as that derived from the public meetings of her citizens—from the proceedings of her legislature—the reports of her canal commissioners and committee on canals and internal improvements, no doubt is entertained that New York is ready to meet the wants and wishes of her citizens by forming the proposed connexion between the improvements of the two states as soon as practicable. Although the subject of such connexion has been agitated for some years in New York; and although she seems to have been preparing for it, by pushing her canals and rail-roads southerly to our borders, yet no direct action in reference to it has been taken by that state until recently. It was no doubt thought expedient to wait the movements of Pennsylvania, to ascertain whether we intended to complete the North Branch canal to Tioga Point, the only place where any connexion could be formed between the canals of the two states. Now, however, when all doubt on that point is removed by the location of the Pennsylvania canal, from the Lackawana river, the present northern termination of the finished work, to the state line; and an assurance is thus given by such location, and the expenditure of much labour and money upon it, that Pennsylvania will do her part in the great work of connexion, New York is acting earnestly and definitely towards the attainment of the same object.

It will be recollected that there are two canals and a rail road already in operation in New York leading from her grand canal to the borders of Pennsylvania.

The *Chenango canal*, which forms a connexion between the Erie canal at Utica, and the Susquehanna river at Binghamton, about

thirty-nine miles from the state line near Tioga Point. This canal is of the same dimensions as the Pennsylvania canal.

The *Chemung canal*, which connects the Chemung or Tioga branch of the Susquehanna at Elmira, about seventeen miles above the pool of the dam at Tioga Point, with the Seneca Lake, and thus with the Erie canal at Montezuma.

There is also the Ithaca and Owego rail-road, running from Owego on the Susquehanna, about sixteen miles above the line to Ithaca, at the head of the Cayuga lake, with which the Erie canal communicates. A company has been formed for the purpose and is now engaged in constructing a *sloop canal* from the Cayuga lake to Sodus Bay, in Lake Ontario, which, when completed, will enable sloops to pass from Ontario to Ithaca, within twenty-nine miles of the Susquehanna at Owego.

These works have not been found productive in consequence of their disconnection at their southern extremities with similar channels of intercommunication. An enlarged and liberal policy has always characterized the improvement system of New York; but she is no doubt influenced too in the measures she is now taking to form a connexion with the Pennsylvania works, by a desire to render profitable the works she has already constructed.

By an act of the General Assembly of New York, passed the 18th day of April, 1838, the canal commissioners of that state were directed to cause a route for the construction of the Chenango canal to be surveyed from its present termination down each side of the valley of the Susquehanna to the state line near Tioga Point. It appears from the report made by the canal commissioners to the legislature of New York, on the 26th of January, 1839, that the survey has been made by Joseph D. Allen, civil engineer, and that the route is entirely practicable. The commissioners remarked that "the surveys which form the subject of this report have terminated at the state line on the most favorable routes, and not in reference to a particular point of connexion. There are however, no obstacles in forming such a connexion on the north side of the Susquehanna, as will be satisfactory to both parties, unless it should grow out of the difficulty of rendering Pennsylvania independent of New York for a supply of water for about four miles of canal."

The north line of this survey is about forty miles long, has seventy seven feet of lockage, and, with the feeder, is estimated by the engineer to cost \$788,149 68.

The line on the south side of the river is about thirty-eight miles long, has a lockage of seventy-four feet, and is estimated to cost \$770,467 35.

On the 11th of February, inst., the committee on canals and internal improvements, in the House of Assembly of New York, made a report "on petitions for a canal from the Chenango canal, at or near Binghamton to the state line, near Tioga Point, so as to connect with the Pennsylvania North Branch canal," in which they state as their opinion of the advantages of the proposed connexion, "that it

is required not only by the wishes and necessities of the inhabitants of that particular section through which the proposed extension will pass, but by the interests of the whole state, that immediate steps be taken to form a connexion between the two greatest and most extended chains of internal improvements in the world; a connexion which would unite the waters of the Hudson, St. Lawrence, and the upper lakes with the Susquehanna and Ohio rivers, and the Delaware and Chesapeake bays by a continuous water communication."

The views and reasoning of the committee are liberal and just; and establish conclusively that the interests of both states demand the connexion. They look to an exchange of the "bituminous coal and iron found near Towanda," and the "anthracite coal in the Wyoming valley, in quantities quite inexhaustible, and of a quality, in the language of Professor Silliman, "equal to any in the world," for the common and hydraulic lime, plaster and salt of New York, among a variety of other articles of commerce, to supply the tonnage for all their works.

This report was accompanied by a bill to carry into effect the proposed plan of connexion. What action has been had on the bill the board have not learned; but it is supposed to be still pending; inasmuch as sufficient time has not elapsed since it was reported for the act to pass through the ordinary forms of legislation.

With regard to the Chemung route the board have learned that in the winter of 1837, petitions were presented praying for an appropriation for a survey from Elmira to Tioga Point, and that the same year, or the next, a resolution was introduced into the House of Representatives of the United States for the same object. The present winter, petitions have been presented to the legislature of New York, asking for the passage of a law to construct this connecting link—and an agent is now at Albany to press this matter upon the attention of that body. The same views which prevailed in the case of the Chenango extension must also be available here. This route, leading into western New York, presents claims at least equal in importance to the Chenango route, which extends into the more eastern portion of that state. In some respects, indeed, it seems to possess even superior advantages. The difference in distance is about one half in favor of the Chemung extension, and the ground is equal, if not more favorable; the summit to overcome by lockage between the Susquehanna valley and the Erie canal, being 257 feet lower by the Chemung than the Chenango canal. The coal trade with western New York, will most probably be greater than with eastern; because in the former direction it can meet with no competition. Such, and other reasons will no doubt induce an early connexion by this route also.

The board scarcely need mention, what is well known to the legislature, that the New York and Erie rail-road has been located through the southern tier of counties in that state. Between the Susquehanna and the Chemung branch and near Tioga Point, the route of this road approaches within a few rods of the state line, and

comes of course very near the northern termination of the Pennsylvania canal. When that road shall be completed, it will afford another convenient and valuable channel of communication with New York, both east and west.

The report of the canal commissioners of the State of New York, on the extension of the Chenango canal, accompanied with the report of J. D. Allen, civil engineer, together with the report of the committee on canals and internal improvements in the House of Assembly of New York, on petitions for a canal from the Chenango canal to the state line, near Tioga Point, accompanied with the bill introduced by the said committee, are herewith submitted.

By order of the board,

JAMES CLARKE,
President Canal Commissioners.

No. I.

Report of the Canal Commissioners of New York, on
the extension of the Chenango canal.

STATE OF NEW YORK.

In Assembly, January 26, 1839.

Report of the canal commissioners on the extension of the Chenango canal.

TO THE LEGISLATURE OF THE STATE OF NEW YORK.

The canal commissioners, pursuant to the act entitled "An act authorizing a survey of a canal from Binghamton to the state line," passed April 18, 1838, have caused a route for the continuation of the Chenango canal to be surveyed from its present termination down each side of the valley of the Susquehanna, to the state line, near-Tioga point.

This service has been performed by J. D. Allen, a civil engineer, who has had considerable experience in the service of the state.

The commissioners have examined the estimates, and the plans of the mechanical structures. The estimates appear to be full, but whether they are adequate to the construction of this canal, it is impossible to say. The error which has too often found its way into the estimated cost of public works, results more from a deficiency in the quantities, and in not including all the works necessary, than from low prices. Indeed, it is difficult, if not impracticable, to foresee and properly estimate all the expenses; and hence it is, that the cost generally exceeds the estimate.

The line of the canal in question, presents several difficult and expensive points; the soil is represented to be of a porous character, and on most of the distance, a lining of a better material than is found in the excavation, appears to be necessary. Provision is made in the estimate to cover this expense, but it must, to some extent, be the subject of conjecture; and this expense may be under estimated.

The rock and hard-pan, is generally overlaid with common excavation, which renders the estimated quantities of these expensive items, a matter of great uncertainty.

It is proposed to construct the masonry of the stone found in the vicinity of this line. They are not of a quality suitable for the face of locks, but are supposed to be of sufficient solidity for walls, with wooden chambers, and for the aqueducts, culverts and bridges.

It is represented as practicable to supply the north line for the whole distance with water from the Chenango river, and the south line from the Susquehanna, at Binghamton. The engineer, however, states, that the levels can be so arranged as to take a feeder from the Susquehanna, in the vicinity of Owego.

The streams intercepted by the canal, are of little value for feeders, and are generally passed under the canal.

If the canal is to be supplied with water from the Chenango river, it would be necessary to make efficient arrangements to pass it from one level to the other; and although a large excess of water is reported, it would, no doubt, be necessary to construct the canal with great care, in order to insure, at all times, an adequate supply.

If a dam is erected, as proposed, across the Chenango river, near its intersection with the Susquehanna, it will entirely destroy valuable mills a short distance up the Chenango. If a feeder is taken from the Chenango river, six miles farther up, it may injure the mills just mentioned, and also, a grist and saw mill at the place where it is proposed to take the water from the river.

It will be seen by the report of the engineer, that if the latter plan is adopted, it will be necessary to make a feeder about six miles in length, passing down the Chenango river on the north side.

The level of the Chenango canal, opposite the point where it is proposed to take the last mentioned feeder, will admit a feeder from the Chenango river; and if the canal had the necessary declivity on the bottom, it would be practicable to pass through it a supply for the new canal, without much inconvenience.

The section of the Chenango canal from the point before alluded to, where a feeder could be admitted, to the departure of the new line, is about six miles in length, and could be so remodelled as to pass the requisite quantity of water; but it would be necessary to do the work during the winter, and it is doubtful whether there would be any economy in adopting this plan.

The act directs a survey and estimate to the state line at the termination of the North Branch canal of Pennsylvania. This canal is not located further than the Chemung river, about four miles from the state line; and the location will probably not be extended until the State of New York shall have determined the line on which they will form a connection.

The surveys which form the subject of this report have terminated at the state line on the most favorable routes, and not in reference to a particular point of connexion. There are, however, no obstacles in forming such a connexion on the north side of the Susquehanna, as will be satisfactory to both parties, unless it should grow out of the difficulty of rendering Pennsylvania independent of New York for a supply of water for about four miles of canal.

The south line terminates at the state line on the south side of the Susquehanna river, and could be connected with the North Branch canal, which is on the west side, by constructing a dam across that

stream, which would raise the water to a proper level for the canal on each side.

Previous to the commencement of the survey, one of the Commissioners accompanied the engineer from Binghamton to the state line, for the purpose of consultation in regard to important matters connected with the survey. Since the survey, neither of the commissioners have been able to examine the particular localities.

The north line, which passes the Chenango river with an aqueduct, is $39\frac{1}{8}$ miles long, has 77 feet of lockage, and, with the feeder, is estimated to cost \$788,149 68, equal to \$20,087 04 per mile.

The other line, which passes the Chenango with a dam, is 40 miles long, has 60 feet of lockage, and is estimated to cost \$765,683 09, equal to \$19,142 40 per mile.

The line on the south side of the river is $38\frac{1}{8}$ miles long, has a lockage of 74 feet, and is estimated to cost \$770,467 35, equal to \$20,268 80 per mile.

The maps and profiles are on file in the canal room.

All of which is respectfully submitted.

WM. C. BOUCK,
JONAS EARLL, Junior,
JOHN BOWMAN,
WILLIAM BAKER,

January 26, 1839.

REPORT

OF JOSEPH D. ALLEN, RELATIVE TO THE CONTINUATION OF THE
CHENANGO CANAL.

To the Hon. the Canal Commissioners of the State of New York.
GENTLEMEN:

In obedience to instructions, I have made an examination and "survey of a route, for the continuation of the Chenango canal at Binghamton, along the valley of the Susquehanna, to the State line near Tioga Point, at the termination of the North Branch canal of Pennsylvania," as contemplated in the "act of 18th April, 1838." The result of which, with an "estimate of the cost," maps, profiles, plans, &c. is herewith presented.

The dimensions of the canal, and the character of the mechanical structures, are in general designed to be the same as those adopted for the Chenango canal, and wherever practicable, provision has been

made in the plans and calculations of cost for the construction of the work in a permanent manner.

The more important of the lateral streams crossed by the line of canal, are found, generally, too near the surface of the ground to obtain the requisite space for their passage under arches of permanent masonry, as would be desired; it is, therefore, designed in the estimates, for most of them, to construct aqueducts, having wood trunks.

Culverts of masonry are provided for passing the smaller streams and surface drainage of the country, under the canal, and wiers for regulating and drawing off the surplus waters of the canals, with side walls of masonry for supporting the banks, have been located wherever required. Composite locks are proposed, having walls of rubble masonry, laid in hydraulic cement throughout, and lined in the chamber with timber and plank. The plan is varied from that on the Chenango canal only in regard to the masonry; the walls of those locks having been laid in Hydraulic lime from the head down to a point only 8 feet below the upper gates, and the remainder dry. The cost is somewhat increased, by making the entire walls of hydraulic masonry, but it is deemed an improvement, especially where stone are not best adapted, either in form size or quality, to such purpose.

A coping of stone upon the whole length of walls, resting along the chamber upon the side lining posts, thus forming a permanent substitute for the plates of timber, embraced in the plan, would be a desirable improvement. The plates and upper timbers of the chamber are exposed more than any others to early decay. I have, however, omitted in the estimate, to provide for the cost of stone coping, which would supply their place, apprehending that suitable stone for this purpose may not be found in the vicinity of the work.

Truss bridges are contemplated, spanning 50 feet, and resting on abutments of quick-lime masonry; those for the streets of villages and the more prominent roads of the country, to have two tracks of 10 feet each, and for the ordinary roads a single width of 15 feet. Bridges for the accommodation of farms are 12 feet wide.

The valley of the Susquehanna, from the present termination of the Chenango canal at Binghampton to the state line of Pennsylvania, is in general about a mile and a half in width. It extends at some points to a greater width, and at others is contracted somewhat within that limit. Upon a general examination of the valley, it was found, that while the ground presents a fair surface, over the chief portion of the distance, either upon the flats of the river, or the moderately elevated plains next above them, for a favorable location of the line, the bounding ridges upon either side, or other bluffs less elevated occasionally approach, for a short distance, quite up to the margin of the river.

The features upon the opposite side of the river are, to a very considerable extent, similarly marked. Wherever, on the one side, the river has found its way along the base of the higher grounds, it has,

on the other, left a wider space of more feasible surface for the object, it was deemed expedient, under the circumstances, to locate a line on each side of the river, that a just comparison of the opposite sides of the valley might be made, and the question of feasibility and cost more satisfactorily determined. Whenever the construction of the work may be authorized, the measure would become necessary to secure the best and most economical location, and it has been regarded as of no less present importance, that the preliminary examination be made alike full.

The Susquehanna river is very broad, varying along the route of the proposed improvement between five and seven hundred feet. It conducts off the drainage of an extensive surface of country, and during the flood seasons discharges a very large quantity of water. Its tributaries are numerous, and many of them large and important streams. Its fluctuations in its flow between flood and drought, are from 14 to 17 feet. The descent in the stream is quite uniform, and the total amount from Binghampton to the State line is 73 feet, averaging less than 2 feet per mile.

By reason of the very gradual inclination in the valley, it will be seen that the lockage must necessarily be distributed over the line in low lifts. The number of locks, though small, will, therefore, be increased beyond what would otherwise be necessary, and their cost in consequence, will be somewhat enhanced.

The line first located, was commenced at Binghampton, and extended down to the State line upon the north side of the Susquehanna, and is denominated the North Line.

The Chenango canal at Binghampton, after passing through the central portion of the village, terminates at the junction of the Chenango and Susquehanna rivers, uniting therewith upon the east side of the former, directly at its mouth, by a lock of 12 feet lift. On continuing the line from Binghampton it becomes necessary to cross one or other of these streams, depending upon whether the north or south side of the Susquehanna is adopted.

In crossing the Chenango, upon the *north line*, it becomes a subject of some importance to determine upon the plan which ought to be preferred, involving as it does, considerations in regard to a supply of water.

I have made the surveys necessary for two plans for crossing the river, the one upon an aqueduct, and the other by the erection of a dam. A line has been located for each object, from Binghampton down the valley to a point (B on the map,) near Croker's brook, where both unite upon the same level. The distance by the aqueduct line, which is the most northerly, is 4 miles, and by the other 4 miles and 52 chains. The difference in cost is shown hereafter.

The line designed to cross the Chenango by an aqueduct, commences on the Chenango canal, at Lewis' basin, and passes directly towards the river. At the distance of $5\frac{1}{2}$ chains, a descent is made by a lock of 5 feet lift, and at the further distance of 6 chains the line reaches the river a short distance below Lewis' mills, and crosses upon

an aqueduct having a wood trunk of 7 spaces each spanning 44 feet, resting upon 6 piers and two abutments of hydraulic masonry, the foundations of which are 21 feet below the bottom of the canal. The stream has a gravel bed, and the abutments and piers of the aqueduct will require piles to be driven for their foundations, which are provided for in the estimate.

The bottom grounds of the river or valley here, are quite narrow, it is therefore a favorable point for crossing upon the requisite elevation. The line approaches the stream for a short distance upon ground 7 to 8 feet below our level. Upon the opposite bank, the surface corresponds with the bottom of the canal, and continuing thence a short distance over a surface somewhat undulating, the line enters the valley of Trout brook. In this valley distant more than a mile from the Susquehanna, we find a favorable depression of the surface ranging in a good direction for a continuation of the line; the grounds intervening between it and the Susquehanna being 20 to 30 feet more elevated.

Pursuing this valley to its summit and down that of Choconut creek, we pass over favorable grounds and reach the flats of the Susquehanna at a point four miles distant from Binghampton, where it is intersected by the river line before referred to, which has been located thus far along the bank of Susquehanna upon a lower level. Upon the line thus far described, the structures in addition to the aqueduct over the Chenango, are 3 locks of an aggregate lift of 21 feet, a wood trunk aqueduct over Choconut creek of 22 feet span, one culvert, 5 road and three farm bridges. Distance 4 miles; aggregate cost as per estimate annexed, \$58,651 37.

The river branch line from Binghampton to this point, leaves the Chenango canal a short distance above the lock at its termination, and after descending by a lock of 4 feet lift to Chenango, is designed to cross the river in the pool of the proposed dam, located about three chains above its mouth. The bed of the stream at this place is five feet below the proposed bottom line of canal. Its formation is rock, overlaid with a moderate depth of gravel. The water during the drought season is quite shoal, averaging one and a half feet in depth.

The erection of the dam to the necessary height, will have the effect to destroy the grist mill and saw mill belonging to Col. Lewis, a short distance above, also a saw mill of less value half a mile farther up the stream. This will become an item of damage, which I omit to estimate.

After crossing the Chenango, the line is located upon the flats of the Susquehanna the greater portion of the distance, and will be made secure from the floods of the stream without extra cost for protection. Entering the valley however upon a low level to avoid the injurious effects of raising the dam higher than is proposed, the line is necessarily confined to the margin of the river, where its banks assume an elevation much above the flats of the valley. The distance upon which it is thus unavoidably exposed to the stream, is 1 mile and 28 chains. The banks upon this portion, rise from thirty to fifty feet, rendering it necessary to build an embankment along the shore, and protect its

exterior by a slope wall carried to the height of the ordinary floods.

The mechanical structures upon this branch of the north line, consist in addition to the dam, of a guard lock, one lift lock of 4 feet, one culvert of 4 feet span, and one of two arches, each 10 feet span, over Choconut creek; a towing path bridge at the crossing of the Chenango, three road and four farm bridges. Distance four and sixty-five one hundredth miles; aggregate cost as per estimate annexed, \$117,597 50.

By the adoption of the river line, the cost of 2 locks, the aggregate lift of which is 17 feet, will be avoided, while an additional expense for a guard lock, a similar structure will be added. But a just comparison of these two branches of the north line, involves a consideration of the cost of procuring a supply of water for the canal.

By adopting the line crossing the Chenango upon an aqueduct, a feeder becomes necessary for the introduction of a supply of water brought from the river at a point about six miles above; the cost of which, with the dam and appurtenances at its head, as per the annexed estimate, is \$66,875 30. This amount in the comparison of cost between these two branches, and plans of crossing the river, should consequently be added to the branch upon which the aqueduct is contemplated. The comparison will then be shown as follows:

Branch line crossing the Chenango by aqueduct,	
distance 4 miles,	\$58,651 37
Lockage 21 feet, at \$735 per foot,	15,435 00
Feeder, as per estimate annexed,	66,875 30
	\$140,961 67
Branch line crossing Chenango by dam dis-	
tance four and sixty-five one hundredth	
miles,	\$117,597 50
Lockage, 4 feet at \$735,	2,940 00
	120,537 50
Difference,	\$20,424 17

Pursuing the route below the junction of these two branches, the valley upon the north side continues broad, and the features regular, to near the end of the 12th mile, where the river for 18 chains washes the base of a bluff gravel bank of upland, elevated from 18 to 40 feet in height. Within this extent we cross two small streams upon wood aqueducts 22 feet span, and pass the village of Union, situated upon an extensive plain apposite the opening of the Nanticoke valley, at the end of the 9th mile. In entering upon this plain on the 8th mile, a depth of cutting ranging from 10 to 12 feet, is encountered for 40 chains. In descending from the plain a mile east of Union village, lock No. 4 is located, of 6 feet lift, after which we pass over Nanticoke creek upon a wood trunk aqueduct, 56 feet in length, resting on stone abutments.

The point of Bluff river bank above mentioned, occurs at the divi-

ding line between the counties of Broome and Tioga, and is too bold to be encountered by a cut, with a view to escape the river. The line must be located along the shore, and the embankment protected by a slope wall for 21 chains.

From this point the river passes off more towards the centre of the valley, and the ground occupied by the line along at the foot of the upland slope, is favorable for our purpose, until the river again approaches the north side of the valley, 2 miles below. Here a spur juts out from the adjacent ridge, which upon the immediate bank of the stream is 50 feet above the ordinary surface of the river.—The main channel runs near its base, and the water is deep. A little back from the river it is less elevated, but yet so high as to require a deep cut to pass it. The level of canal bottom is here 21 feet above the surface of the river, and is necessarily kept up to escape some high ground farther down the stream. To pass around this point would therefore require a heavy embankment, with a protection wall to guard it from the abraisions of the river, which would also be expensive. The location has been preferred across the point, and the deep cutting thus encountered extends 20 chains, ranging between 14 and 28 feet.

Upon the next succeeding 2 miles, the line occupies the intervalle grounds, passes Camp's, East Owego post office; thence along near the road to the termination of the flat where the river again comes upon the north side of the valley. We continue thence upon a narrow table of ground, now occupied by the road, near the brow of the bank, for $1\frac{1}{2}$ miles. The outer slope of the towing-path, 27 chains of this distance, will fall within the bank of the river, and require a wall protection. Passing on thence $\frac{1}{4}$ of a mile, a descent is made in the 5th lock of 8 feet, which brings the line down upon the bottom of the valley, and it now gradually departs from the river as the valley widens out, and continues half a mile or upwards therefrom, following generally near the foot of the northern slope for the next succeeding $9\frac{1}{2}$ miles. Here, upon the 27th mile, it again meets the river at the Owego narrows.

Little Nanticoke creek is passed on the 20th mile, on a wood aqueduct spanning 22 feet. At the end of the 22d mile, we reach the village of Owego, located directly upon the bank of the river at the junction of the broad valley of Owego creek with that of the Susquehanna. The line is located here on the north borders of the village, near the base of the hill. Directly opposite the village, after passing the Ithaca and Owego turnpike, lock No. 6 is located, having a lift of 6 feet; we then pass the "Ithaca and Owego rail-road," upon a level $10\frac{1}{4}$ feet below the track.

A mile distance from the village we pass Johnson's mill canal and Owego creek, both of which are crossed upon wood trunk aqueducts on abutments and piers of masonry, the former 22 feet span, and the latter having a total length of 82 feet in three spaces, elevated $10\frac{1}{2}$ feet above the bed of the stream.

The valley of Owego creek is occupied by the line a mile in extent;

the surface is smooth and regular, and for nearly one-half the distance is from 2 to 3 feet below the bottom line of canal. Between Owego creek and the *narrows*, locks No. 7 and 8 are located, with an aggregate lift of 15 feet.

The Owego *narrows* are half a mile in extent. The river here flows at the foot of the high ridge bounding the valley. The face of the ridge has a steep inclination, and appears to be composed entirely of loose gravel. At this base the main road passes along near the water edge, elevated from 6 to 10 feet above the ordinary summer stage of the stream, but is rendered impassible for a short time in the flood season. The line must follow the base of the hill, and the towing-path embankment rest in the edge of the river, having its outward slope guarded by a wall from the effects of the current.

Passing on from the *narrows*, the bottom of the valley again widens out, and the river now pursues a course more nearly in its centre most of the remaining distance, and the line has been continued generally near the foot of the northern slope. One mile below we cross Pipe creek upon an aqueduct of 22 feet span, a few chains below the small village of Tioga; thence two miles distant descend by a lock of 7 feet lift, and continuing over features generally favorable, though at a few points slightly undulating another mile, we encounter the point of a high plain which comes to the river and crowds the line near the shore for 20 chains. As the line is now located, the embankment here will require a protection wall 24 chains; on revising the line, however, it may probably be found, that by a change of the levels, keeping up the lock last located, this point in the river may be avoided without additional expense.

Upon the 32d mile, which is the next succeeding, we pass the village of Smithboro', opposite to which the line runs over a low flat, 20 chains in extent, which is from 4 to 9 feet below canal bottom. The ridge is here intersected by the valley of a small stream, coming down from the right, rendering it necessary to form the full width of embankment on the flat, embracing both towing-path and berm, which will become expensive. By removing two or three buildings, which now obstruct the passage, and carrying the line a few chains north of the present location, the cost would be considerably reduced.

Two and a half miles below Smithboro', continuing over a feasible surface, we reach the village of Barton. Within the next mile, after crossing Barton brook, requiring a wood aqueduct of 22 feet span, and some undulating features in rear of the village, the line passes over a high table of ground, which stretches from the river back to the mountain, where it is subjected to an average cut of 15 feet for 30 chains. Next follows some descending ground, upon which locks No. 10 and 11 are located, each 7 feet lift, and distant from each other half a mile.

Ground highly favorable, extends thence nearly to the end of the 38th mile. At this point the river flows a distance of 15 chains, directly at the foot of a bold gravel bank, projecting out from the main ridge. Its base is 16 feet below the bottom level, and its height from

40 to 50 feet. A heavy embankment will occupy the edge of the river, with an exterior protection wall 24 chains.

From this point the survey was continued, in the first instance, to the state line, down the bank of the river, but the line was afterwards abandoned on account of its unfavorable character, being exposed to the stream, and much of the distance confined under a bluff bank along the shore. A further examination resulted in a continuation of the line, as shown upon the map; leaving the river at the point of bluff bank above mentioned, at the end of the 38th mile, passing down the west side of the high and irregular grounds which are adjacent to the stream, and terminating at the state line $\frac{1}{2}$ a mile west of the river, upon grounds favorable for a connexion with the North Branch canal of Pennsylvania.

The distance is 25 chains greater than by the shore of the river; the ground, however, with the exception of 9 chains, averaging $16\frac{1}{2}$ feet cutting, is regular in its features, and ordinarily favorable. The total distance from Binghampton to the state line, by this route, leaving the Chenango canal at Lewis' basin, is $39\frac{15}{100}$ miles, or by taking the branch of the line which crosses the mouth of the Chenango by the proposed dam, thirty-nine eighty one hundredth miles. The lockage by the former is 77 feet, distributed in 11 locks, and by the latter, 60 feet, in 9 locks.

SOUTH LINE.

Located on the south side of the Susquehanna.

This line leaves the Chenango canal in the village of Binghampton, at the foot of Evans' basin, and passess directly across the Susquehanna upon a wood trunk aqueduct, having 10 spaces, each 44 feet, resting upon 2 abutments and 9 piers of masonry; piles are designed for their foundations. The bed of the stream is gravel, and is 21 feet below the bottom level of the canal. The present level of Evans' basin not being sufficiently elavated for a continuation over the Susquehanna, without exposure to its highest floods, I have provided, in the estimate, for raising the banks, and other works appertaining to the level, 2 feet.

Soon after crossing the river, a descent is made of 16 feet in 2 locks, with a "pound reach" between them of 7 chains. The line passes thence one mile upon the river flat, then follows at the base of a high upland bank along the shore of the river upon the succeeding mile, and from thence to Willow point, $1\frac{1}{4}$ miles down the stream; the high ground recedes from the river, and we again occupy a narrow flat, most of which is secure from the effects of the current.

The bold precipitous bank of Willow point then rises steep from the river, and again forces the line along the shore at its base for 30 chains; passing thence a like distance over a narrow flat of sufficient width to escape the river, we are again driven upon the shore along the foot of a steep bank 40 feet high, for 40 chains, where, at the end of the 5th mile, we are enabled to leave the river and enter upon a more

regular surface. Thus far from Binghampton this line will be expensive: much of it is unavoidably located upon unfavorable ground; $2\frac{1}{2}$ miles are carried along the shore of the river at the foot of a high bank, and will require a slope wall protection against the floods of the stream.

Upon the next succeeding mile the features are, in part, undulating, some heavy embankment occurs, and also a few chains of upland, cutting 10 to 15 feet in depth; passing this, the valley becomes broad, and the surface continues highly favorable to south Choconut creek, $3\frac{1}{2}$ miles.

Passing over this stream upon an aqueduct of 2 spaces, with a wooden trunk 56 feet in length, a broken and irregular surface continues half a mile, somewhat more than ordinarily expensive. Thence the valley continues of a good width, and the line is carried, in general, near the foot of the upland slope, in a fair direction, and at a favorable cost, the next following 5 miles, to Apalachian creek. Randal's brook, the only stream occurring in this distance, requires a single span aqueduct of 22 feet.

The ground at the opening of the Apalachian valley is depressed 3 to 4 feet below the bottom level, causing some heavy embankment for 20 chains. The creek requires a wood trunk aqueduct 56 feet in length; the line then runs over an undulating surface 1 mile, and again meets the river at the foot of an elevated plain. The bank here is composed of loose gravel, and rises steep from the shore 40 feet high. We continue along the shore half a mile to the termination of the plain, from whence the river bears off towards the opposite side of the valley.

Leaving the river at this point, we have 3 miles, next succeeding, upon the more regular grounds of the valley. Thence again, within the next following mile, we are driven upon the shore at the foot of some high projections from the adjoining ridge, a distance of 60 chains. This is succeeded by 3 miles of favorable ground, and within this distance we pass the bridge opposite Owego village, and cross mill creek, a small stream, three-fourths of a mile below, upon an aqueduct on stone abutments, 56 feet in length.

We now enter upon the 25th mile, where the river washes the base of a precipitous rocky bank 150 to 200 feet in height for 60 chains. The embankment must chiefly rest here upon the bed of the stream, and as in all like cases where the location is thus confined to the border of the river, the embankment will become heavy and require a strong protection wall upon its exterior.

The remaining distance down the valley to the state line is 13 miles. The valley continues broad and presents a very regular surface. The lateral streams are few and small. Wapasena creek at the village of Wapasena is the principal, besides which there are two smaller ones; the former requires an aqueduct 62 feet in length on piers and abutments of masonry, and the two latter each a single span of 22 feet.

This portion of the line is nowhere subjected to excessive expense, and it may be sufficient to say that the ground continues favorable for

the object. The termination of this route at the state line is upon the valley intervalle, and at a point which is favorable to the contemplated connexion with the North Branch canal of Pennsylvania.

The lockage upon this line is 74 feet, distributed in 10 locks. Total distance thirty eight-one-twenty-hundredth miles.

It will be observed by a reference to the maps, and from the general description given of the more prominent features of the ground over which the lines upon either side of the valley have been located, that there are several points occurring of unavoidable exposure to the encroachments of the river. It is at these points that the more heavy items of expense occur. Wherever the line is thus forced along the shore of the stream, the embankments become heavy from the necessity of keeping up the levels and carrying the work to the height required to place it above the reach of the floods. In all these cases it becomes necessary also to protect the banks of the canal by substantial slope walls (raised sometimes to a considerable height,) from the abrasions of the stream. These have been provided in all cases in the estimates and as will there be observed, they form prominent items in the cost of this description of the work. With the exception of the points of the above character, the features of the valley are in general favorable for the object.

It will be seen in the estimates in detail, that provision has been made for lining the banks and bottom of the canal to a considerable extent upon most of the sections. The general character of the soil upon either side of the valley, appears to be gravel sometimes intermixed with loam or clay, but upon much of the distance is accompanied with sand. There are frequent indications of a porous character, and I have deemed it expedient to provide for the supply of materials suitable for rendering the works as far as practicable, impervious to water, wherever those of an opposite character have appeared likely to be found. I have also provided for puddling the lining upon the bottom of the canal in order the more effectually to secure the object in design.

Supply of water.

A supply of water for the canal must be procured either from the Chenango or Susquehanna river. From the line on the north side of the Susquehanna, I propose to obtain the required quantity from the Chenango, either drawn directly from the river at the dam proposed to be erected at the place of crossing the river, or if the crossing be upon the contemplated aqueduct, to be drawn through a feeder brought down upon the west side of the river, from Crocker's mills six miles above.

For the south line, I have designed to draw a supply from the Susquehanna, through a short feeder from Eldridge's mills, to unite with the canal a few chains below the proposed Susquehanna aqueduct.

Surveys for these feeders have been made, and whatever relates to their location and cost will be more clearly seen by a reference to the accompanying maps and estimates.

There is a much larger quantity of water flowing in either of these rivers when at their lowest stage in the drought season, where it would be thus drawn into the canal, than would be necessary for the supply required, if the work be constructed with the care and faithfulness which has been contemplated in the estimates.

Whether the full supply of water demanded for maintaining the levels at all times through the entire line, may be safely relied upon when drawn from one extreme of the work, will depend both upon the nature of the soil, its adaption to the purpose of holding water, and the care with which the banks and other parts of the work are constructed.

With the very liberal provisions which I have made in the contingent items of lining and puddling, which appear in the estimates, it is believed the supply of water, may be maintained in the manner proposed. If, however, upon a more full knowledge of the nature of the soil, which may be derived upon the lower part of the line, by first commencing the excavations on that portion of the work, it shall appear necessary to procure an additional supply, it may be obtained at a medium point from the Susquehanna, in the vicinity of Owego.

This will involve some additional expense, but the amount will be confined principally to the cost of a dam, which will be required, and its appurtenances. Some additional expense will be thus occasioned, either in the construction of a short feeder, or upon one or two miles of the canal, by dropping down the levels sufficiently to receive the water thereby exposing the work to the floods of the river, and in consequence enhancing somewhat to the cost for protection.

By thus adding to the supply of water at a medium point on the line, it may doubtless be safe to dispense a portion of the lining and puddling, for which allowance has now been made, as its importance will then become somewhat diminished, and I have little doubt that the expense thus saved, would very nearly if not quite provide for the contingent cost of introducing the additional supply after the dam is constructed.

The quantity of water flowing in the Chenango river in the dry season, determined from the average of several gauges made of the stream at different points between Crocker's mills and its mouth, when at its lowest stage during the past season, was found to be 12,800 cubic feet per minute. The quantity found in like manner flowing in the Susquehanna, was 33,100 cubic feet per minute.— Either of these quantities is much greater than is demanded for the canal. The quantity which could be procured in the dry season from the small streams on the line is so inconsiderable, I have omitted to make any estimate for introducing them into the canal.

In estimating the quantity of lockage water for this extension, if we assume the amount of business to be the same as that originally estimated by the engineer in his calculations for the quantity of water to be drawn from the summit of the Chenango canal, equal in average of 25 boats per day passing in each direction, there will be a demand for 50 locks of water every 24 hours, which will be equal to 328 cubic feet per minute. Adding a contingent allowance for loss by

construction; and will now proceed briefly to enumerate some of the reasons which have operated upon their minds in forming that opinion.

It is well known that bituminous coal and iron are found near Towanda, at a distance varying from fifteen to forty miles from the state line, and anthracite coal in the Wyoming valley, at the distance of ninety miles from said line (and through which the Pennsylvania North Branch canal passes) in quantities quite inexhaustible; and of a quality, in the language of Prof. Silliman "equal to any in the world;" but for want of a market have been comparatively but little used, and that it only requires an avenue for transportation to bring the rich products of these mines into the waiting markets of our own state, and thus furnish to our citizens an abundant supply of these articles of prime necessity at a very cheap rate, and from sources which can never be exhausted.

If this canal be built, coal which is worth but one dollar twenty-five cents per ton on the bank of the Pennsylvania canal ready to load, can be transported to Utica, and all our eastern and western markets without transshipments, and allowed half a cent per ton per mile for tolls, and one cent per ton per mile for cost of transportation, which the committee believe is a very liberal estimate of the expense, will cost at the state line, ninety miles from the beds, \$2 60 per ton. At Utica, two hundred and twenty-four miles, \$4 61 per ton. At Syracuse, two hundred and eighty-five miles, \$5 52 per ton, and at Albany, three hundred and thirty-four miles by the Erie canal, \$6.26 per ton. At the foregoing prices or anything near them, the committee will not undertake to estimate the vast amount of their annual consumption, or what, in the language of a distinguished gentleman of Pennsylvania "must be the tonnage that measures a nation's fuel."

In some of the counties bordering upon the Erie and Chenango canals, there exist inexhaustible beds of common limestone, gypsum and water lime; and these articles, together with salt, are now exported in large quantities into northern Pennsylvania. Notwithstanding all the expenses and delays of a considerable land carriage, and the hazard of a dangerous river navigation which can be used only in freshets, and for all of which nothing can be received in payment but cash, for want of a suitable avenue for transportation. When, therefore, it is considered that for coal and iron many parts of our own state must be dependent upon Pennsylvania and can, if the proposed canal be constructed, procure them from thence at a cheaper rate than in any other direction; and that the northern part of that state is entirely unprovided with common or water lime, plaster or salt, and must look to New York for her supplies of these indispensable articles; the immense advantages of a direct water communication between the rich mineral districts of the two states, we think, cannot fail to be duly appreciated.

The foregoing, however, are by no means the only articles that would seek a market through the proposed canal. It would pass

through a section of the State not only abounding in agricultural products, but where there is annually manufactured many millions of feet of excellent lumber which is now sent down the river for sale ; a large proportion of which, if this communication was made, would seek the better markets of our own State. In addition to this, the committee are informed, that during the last summer, about twelve hundred tons of merchandize have been transported to our eastern cities upon the Erie canal, the Cayuga lake, and the Ithaca and Owego rail-road to Owego, and from thence forwarded by teams ; and the Susquehanna river in times of high water to places below, mostly in Pennsylvania. By constructing the proposed work, the distance between Utica and all places east of there and the state line, will be fifty-two miles less than by the Cayuga lake ; and two transshipments, with the attendant expenses of storage, &c. will be avoided. It will for all practical purposes, not only bring the citizens of northern Pennsylvania that distance nearer to our own commercial emporium, thereby vastly increasing the amount of merchandize which will be purchased in New-York, but enable them to pay for such purchases in articles which are now of but little value to them, although nearly indispensable to the people of this State.

The committee, believing that a canal which will unite such extended waters, passing through a country affording the materials for an immense trade, must teem with business of every description ; that it is warranted by the amount of revenue which it would secure to the State arising from the tolls thereon, and also on the canals already constructed, and is required by the interests and necessities of the people of a large portion of the State ; that her finances will be profited, her resources developed, and the wealth and prosperity of her inhabitants promoted by constructing the work, have prepared a bill which they now respectfully ask leave to present.

No. III.

STATE OF NEW YORK.

In Assembly, February 11, 1839.

AN ACT

To construct a canal from the Chenango canal at or near the village of Binghamton, to the state line, near Tioga point.

The People of the State of New York, represented in Senate and Assembly, do enact as follows :

SECTION 1. The canal commissioners shall proceed with all reasonable diligence to construct and complete a canal from the Chenango canal, at or near the village of Binghamton in the county of Broome, down the valley of the Susquehanna river, by the most advantageous route to the state line near Tioga point, so as to connect with the

Pennsylvania North Branch canal; and the said commissioners in determining the route and termination of the said canal, shall be influenced by a regard for economy and public utility.

§ 2. The canal shall be constructed of the same width and depth of the Chenango canal, and the locks shall be what is called a composite lock of wood and stone in the manner recommended by Joseph D. Allen, civil engineer, in the report of his survey presented to the legislature this session, unless the said canal commissioners shall deem locks of a different construction cheaper and more useful.

§2. The commissioners of the canal fund shall borrow, on the credit of the state, for the construction of said canal, a sum not exceeding eight hundred thousand dollars, at an interest not exceeding five per cent; and the said commissioners shall contract for a loan of the whole sum required to construct the said canal not exceeding the sum before mentioned, at once, to be paid in such times and in such parcels, as the said commissioners shall specify; or the said commissioners shall borrow from time to time such sum or sums as shall be required for the construction of the said canal, as they shall find most for the interest of the state.

§ 4. All loans made for the purpose aforesaid, shall be paid at the discretion of the commissioners of the canal fund after the year one thousand eight hundred and or sooner if the debt now charged on the canal revenues shall have been paid, and for such loans certificates of stock shall be issued in the manner directed in and by the "act to improve the funds and provide for the redemption of the funded debt of this state."

§ 5. Rates of toll not less than those which are now or may be legally established on the other canals of this state, shall be imposed and collected on the canal to be constructed by virtue of this act ; and such tolls shall be pledged, appropriated and applied to the payment of the interest and principal of the sums borrowed for the construction of said canal, and such rates of toll shall never be less than those which are now or hereafter may be established on the Chenango canal, until such payment is completed.

§ 6. All premiums obtained on loans made for the construction of said canal, shall be deposited with some safe incorporated company, at the highest rate of interest that can be obtained, and applied to the payment of the interest on such loans.

§ 7. If the funds appropriated in the preceding sections shall not prove sufficient to pay the cost and expenses of constructing the said canal, at the time when the certificates of stock shall become due, then it shall be the duty of the commissioners of the canal fund, to pay the same out of any moneys which may be on hand belonging to the canal fund, which may not be pledged by the constitution and laws of this state.

§ 8. Such canal shall be known by the name of